FIG. 1

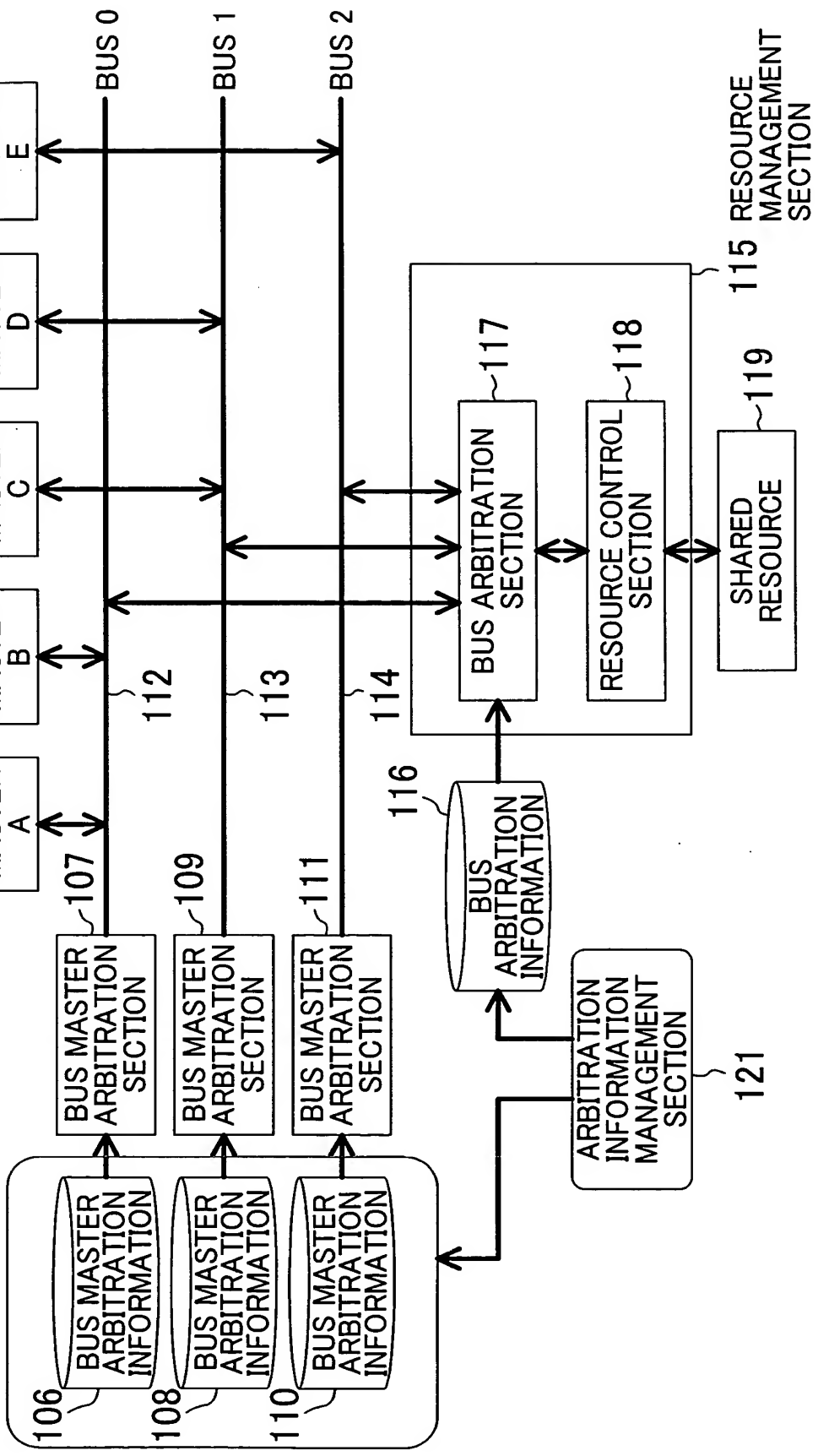

BUS MASTER A
BUS MASTER B
BUS MASTER C
BUS MASTER D
BUS MASTER E
101
102
103
104
105
BUS 0
BUS 1
BUS 2
112
113
114
107
109
111
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
106
108
110
BUS ARBITRATION INFORMATION
116
ARBITRATION INFORMATION MANAGEMENT SECTION
121
RESOURCE MANAGEMENT SECTION
115
BUS ARBITRATION SECTION
117
RESOURCE CONTROL SECTION
118
SHARED RESOURCE
119

FIG. 2

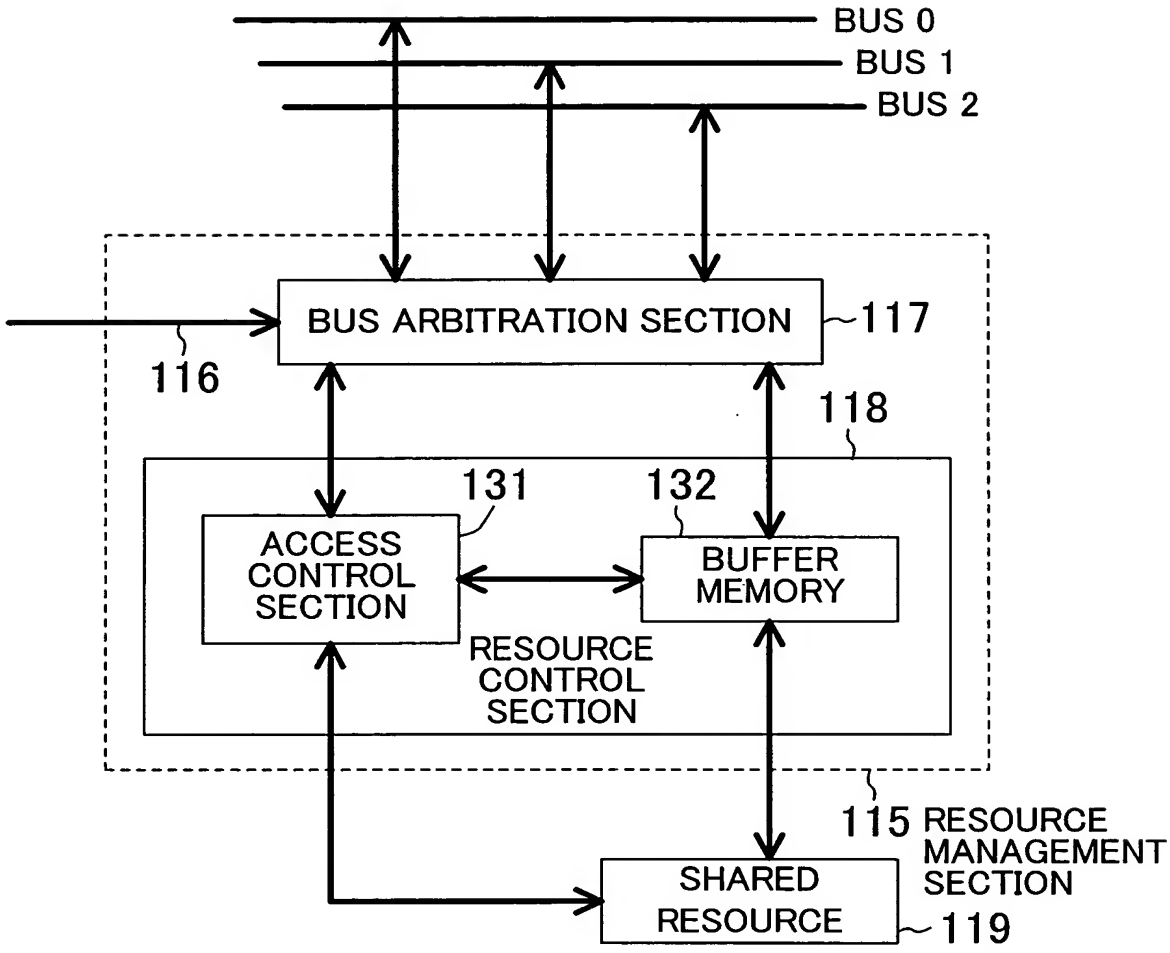

BUS 0
BUS 1
BUS 2
BUS ARBITRATION SECTION
117
116
118
131
132
ACCESS CONTROL SECTION
BUFFER MEMORY
RESOURCE CONTROL SECTION
115 RESOURCE MANAGEMENT SECTION
SHARED RESOURCE
119

FIG. 3

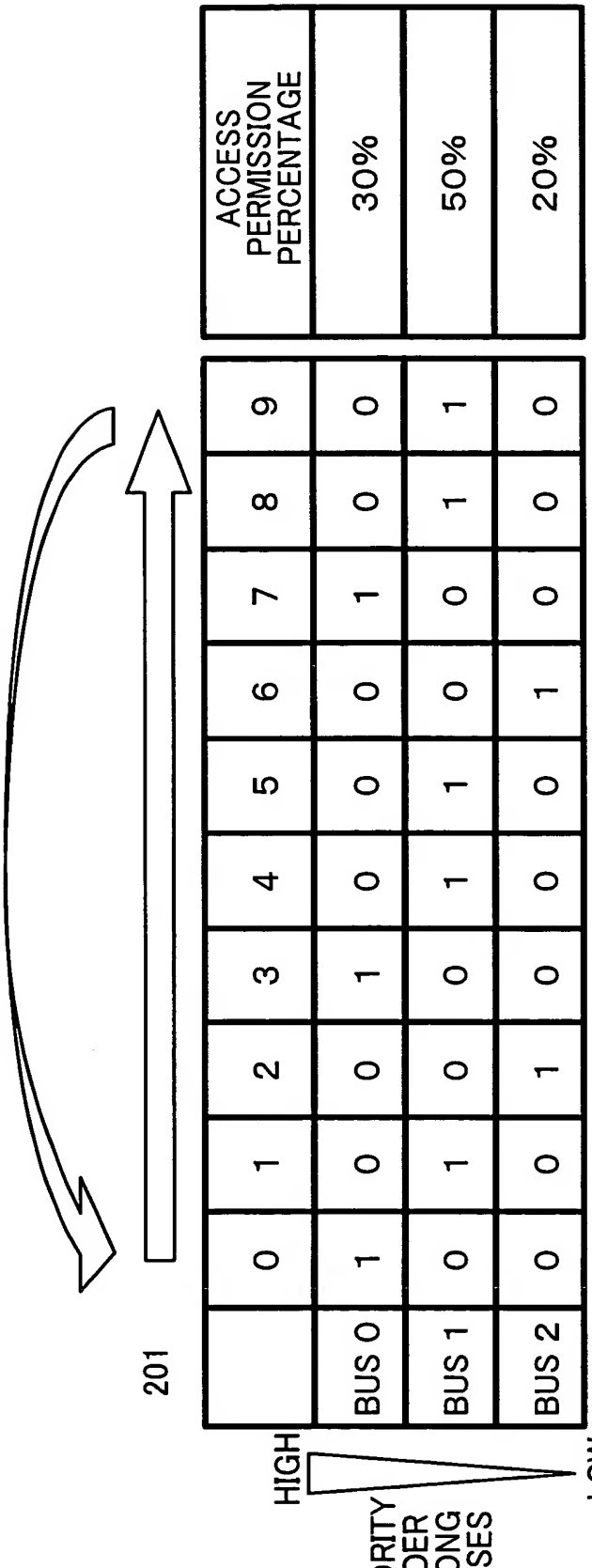

201
0
1
2
3
4
5
6
7
8
9
ACCESS PERMISSION PERCENTAGE
BUS 0
1
0
0
1
0
0
0
1
0
30%
BUS 1
0
1
0
0
1
1
0
0
1
1
50%
BUS 2
0
0
1
0
0
0
1
0
0
0
20%
HIGH
LOW
PRIORITY ORDER AMONG BUSES

FIG. 4

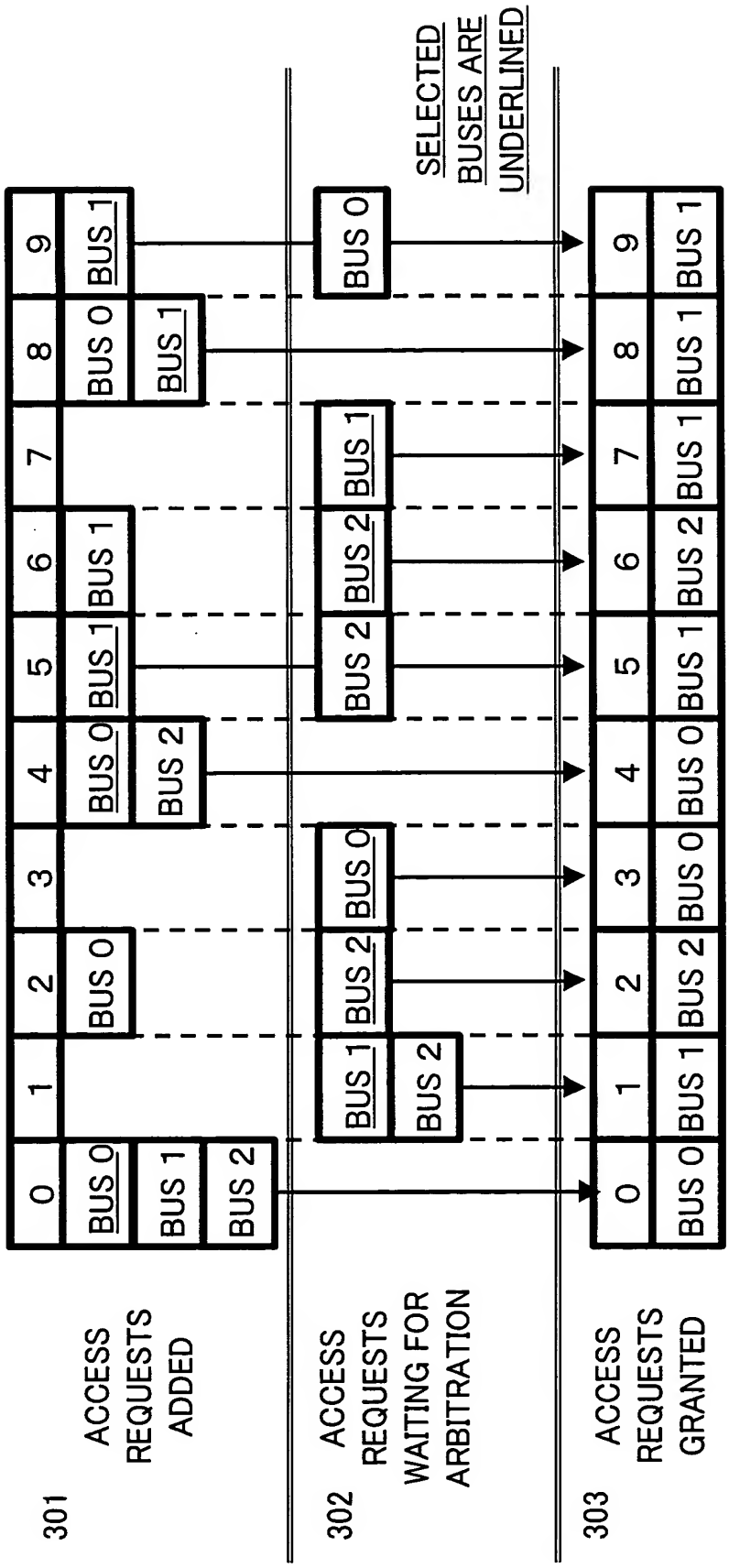

SELECTED BUSES ARE UNDERLINED
301
ACCESS REQUESTS ADDED
302
ACCESS REQUESTS WAITING FOR ARBITRATION
303
ACCESS REQUESTS GRANTED
0
1
2
3
4
5
6
7
8
9
BUS 0
BUS 1
BUS 2

FIG. 5

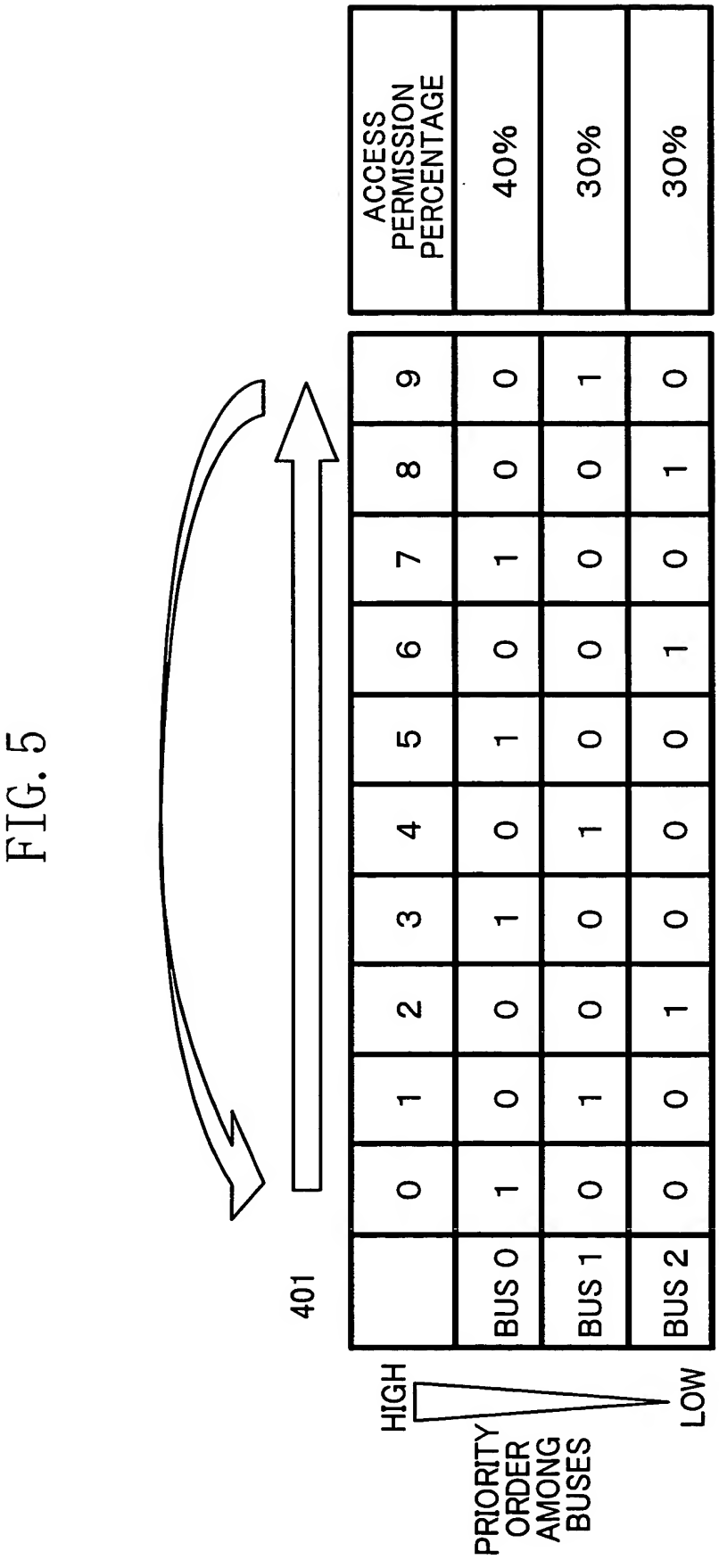

401
0
1
2
3
4
5
6
7
8
9
ACCESS PERMISSION PERCENTAGE
BUS 0
1 0 0 1 0 1 0 1 0 0
40%
BUS 1
0 1 0 0 0 0 0 0 1 0
30%
BUS 2
0 0 1 0 0 0 1 0 1 0
30%
HIGH
LOW
PRIORITY ORDER AMONG BUSES

FIG. 6

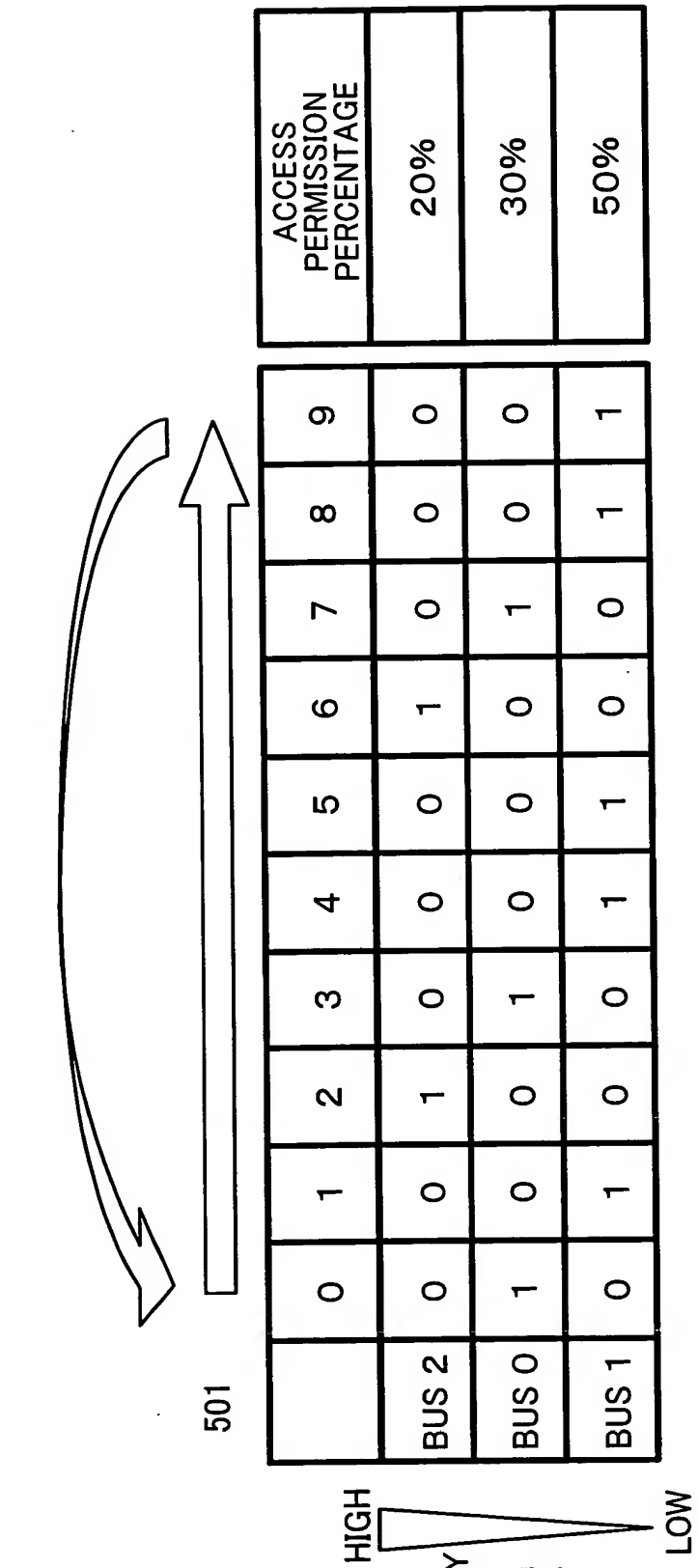

501
0
1
2
3
4
5
6
7
8
9
BUS 2
0
0
1
0
0
0
1
0
0
0
BUS 0
1
0
0
1
0
0
0
1
0
0
BUS 1
0
1
0
0
1
1
0
0
1
1
ACCESS PERMISSION PERCENTAGE
20%
30%
50%
HIGH
LOW
PRIORITY ORDER AMONG BUSES

FIG. 7

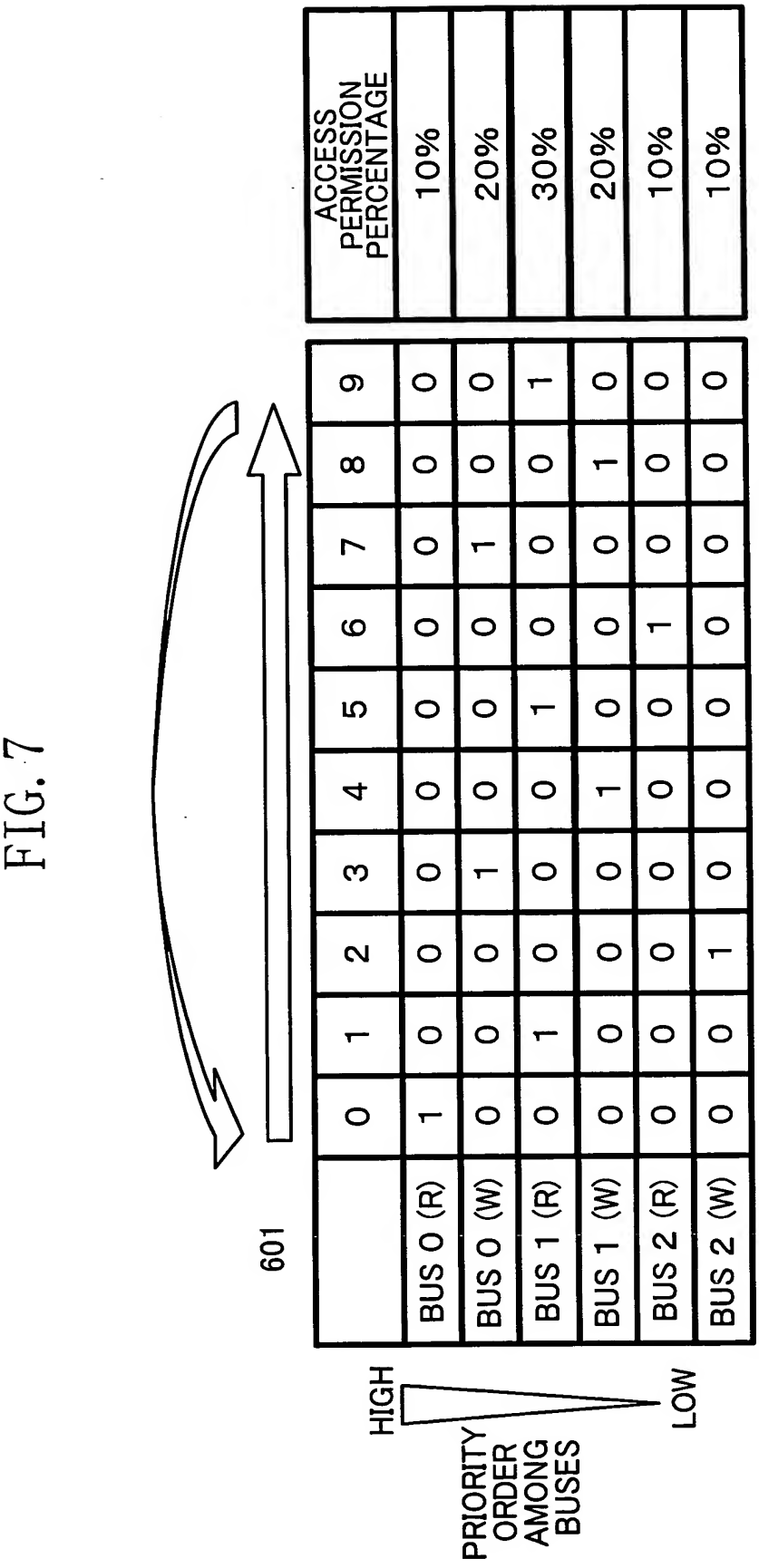

601
HIGH
PRIORITY ORDER AMONG BUSES
LOW
ACCESS PERMISSION PERCENTAGE
BUS 0 (R) 1 0 0 0 0 0 0 0 0 0 10%
BUS 0 (W) 0 0 0 1 0 0 1 0 0 0 20%
BUS 1 (R) 0 1 0 0 0 1 0 0 0 1 30%
BUS 1 (W) 0 0 0 0 1 0 0 0 1 0 20%
BUS 2 (R) 0 0 0 0 0 0 1 0 0 0 10%
BUS 2 (W) 0 0 1 0 0 0 0 0 0 0 10%

FIG. 8

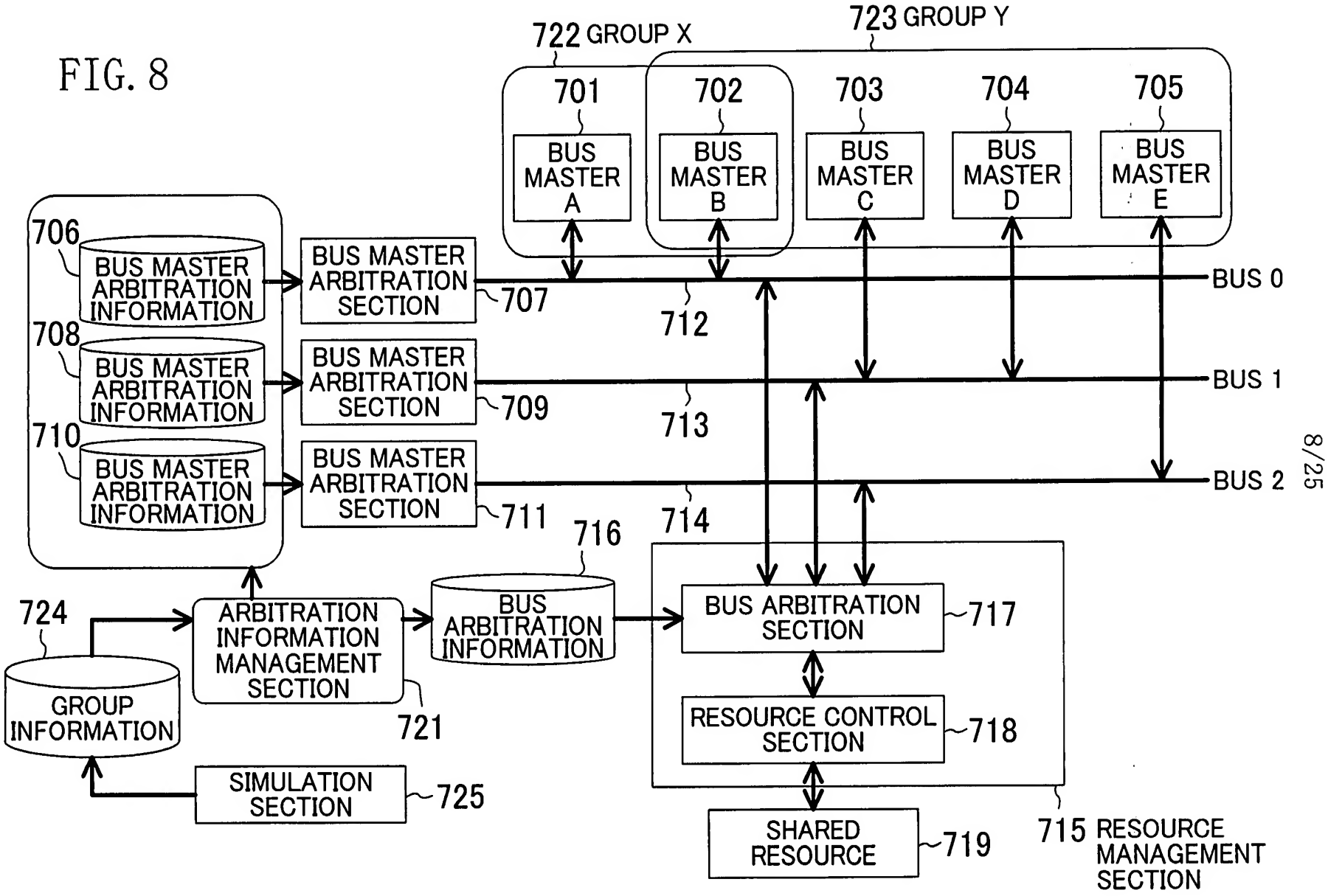

722 GROUP X
723 GROUP Y
701
702
703
704
705
BUS MASTER A
BUS MASTER B
BUS MASTER C
BUS MASTER D
BUS MASTER E
706
BUS MASTER ARBITRATION INFORMATION
708
BUS MASTER ARBITRATION INFORMATION
710
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION SECTION
707
BUS MASTER ARBITRATION SECTION
709
BUS MASTER ARBITRATION SECTION
711
712
713
714
BUS 0
BUS 1
BUS 2
716
BUS ARBITRATION INFORMATION
724
GROUP INFORMATION
ARBITRATION INFORMATION MANAGEMENT SECTION
721
SIMULATION SECTION
725
BUS ARBITRATION SECTION
717
RESOURCE CONTROL SECTION
718
SHARED RESOURCE
719
715 RESOURCE MANAGEMENT SECTION

FIG. 9

901

	0	1	2	3	4	5	6	7
BUS MASTER A	1	1	0	1	0	0	0	1
BUS MASTER B	0	0	1	0	1	1	1	0

902

ACCESS PERMISSION PERCENTAGE FOR EACH BUS MASTER
50%
50%

911

	0	1	2	3	4	5	6	7	8	9
BUS MASTER C	1	0	1	1	0	0	0	1	0	0
BUS MASTER D	0	1	0	0	1	1	1	0	1	1

912

ACCESS PERMISSION PERCENTAGE FOR EACH BUS MASTER
40%
60%

921

	0	1	2	3	4	5	6	7	8	9
BUS 0	0	0	0	1	0	0	0	1	0	0
BUS 1	0	1	0	0	1	1	0	0	1	1
BUS 2	1	0	1	0	0	0	1	0	0	0

922

ACCESS PERMISSION PERCENTAGE FOR EACH BUS
20%
50%
30%

FIG. 10

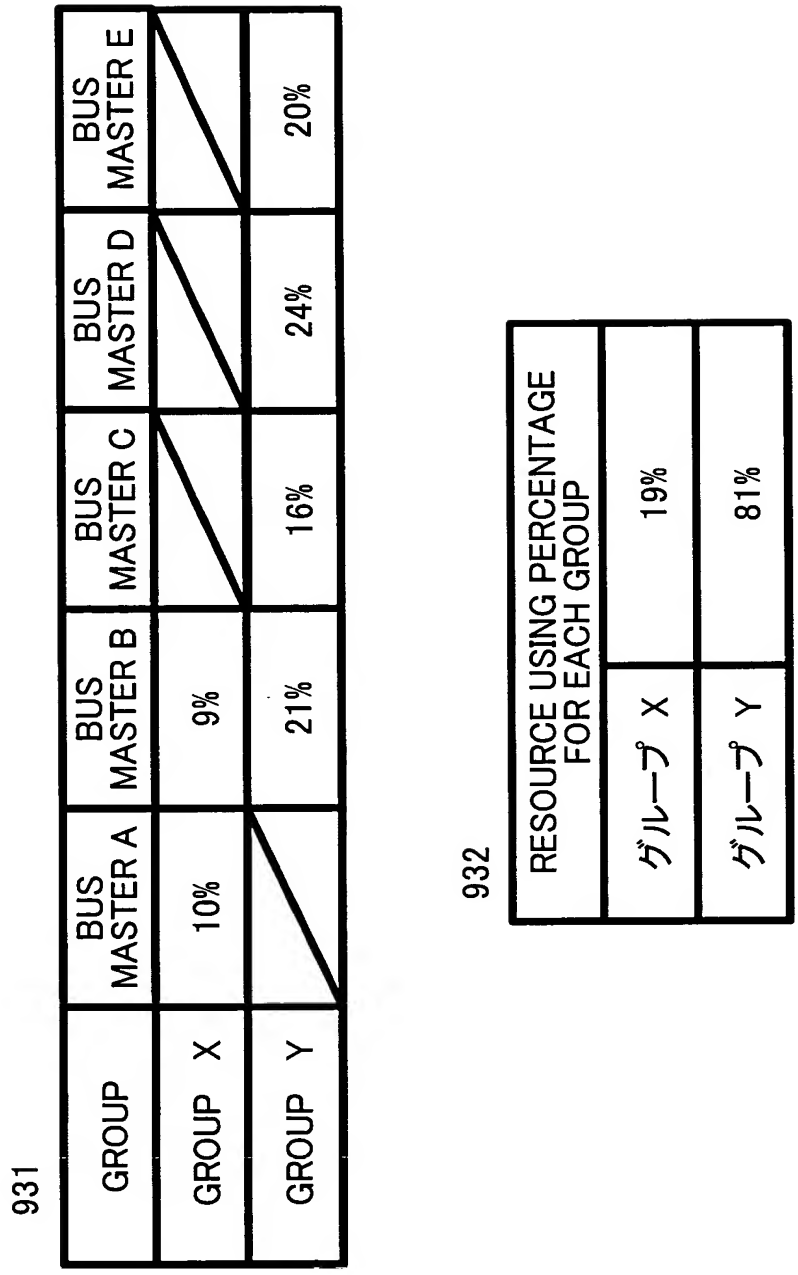

931
GROUP
BUS MASTER A
BUS MASTER B
BUS MASTER C
BUS MASTER D
BUS MASTER E
GROUP X
10%
9%
24%
GROUP Y
21%
16%
20%
932
RESOURCE USING PERCENTAGE FOR EACH GROUP
グループ X
19%
グループ Y
81%

FIG. 11

1001

	0	1	2	3	4	5	6	7
BUS MASTER A	1	0	0	1	0	0	0	0
BUS MASTER B	0	1	1	0	1	1	1	1

1002

ACCESS PERMISSION PERCENTAGE FOR EACH BUS MASTER
25%
75%

1011

	0	1	2	3	4	5	6	7	8	9
BUS MASTER C	1	0	1	1	0	0	0	1	0	0
BUS MASTER D	0	1	0	0	1	1	1	0	1	1

1012

ACCESS PERMISSION PERCENTAGE FOR EACH BUS MASTER
40%
60%

1021

	0	1	2	3	4	5	6	7	8	9
BUS 0	0	0	0	1	0	0	1	1	0	1
BUS 1	0	1	0	0	1	1	0	0	1	0
BUS 2	1	0	1	0	0	0	0	0	0	0

1022

ACCESS PERMISSION PERCENTAGE FOR EACH BUS
40%
40%
20%

FIG. 12

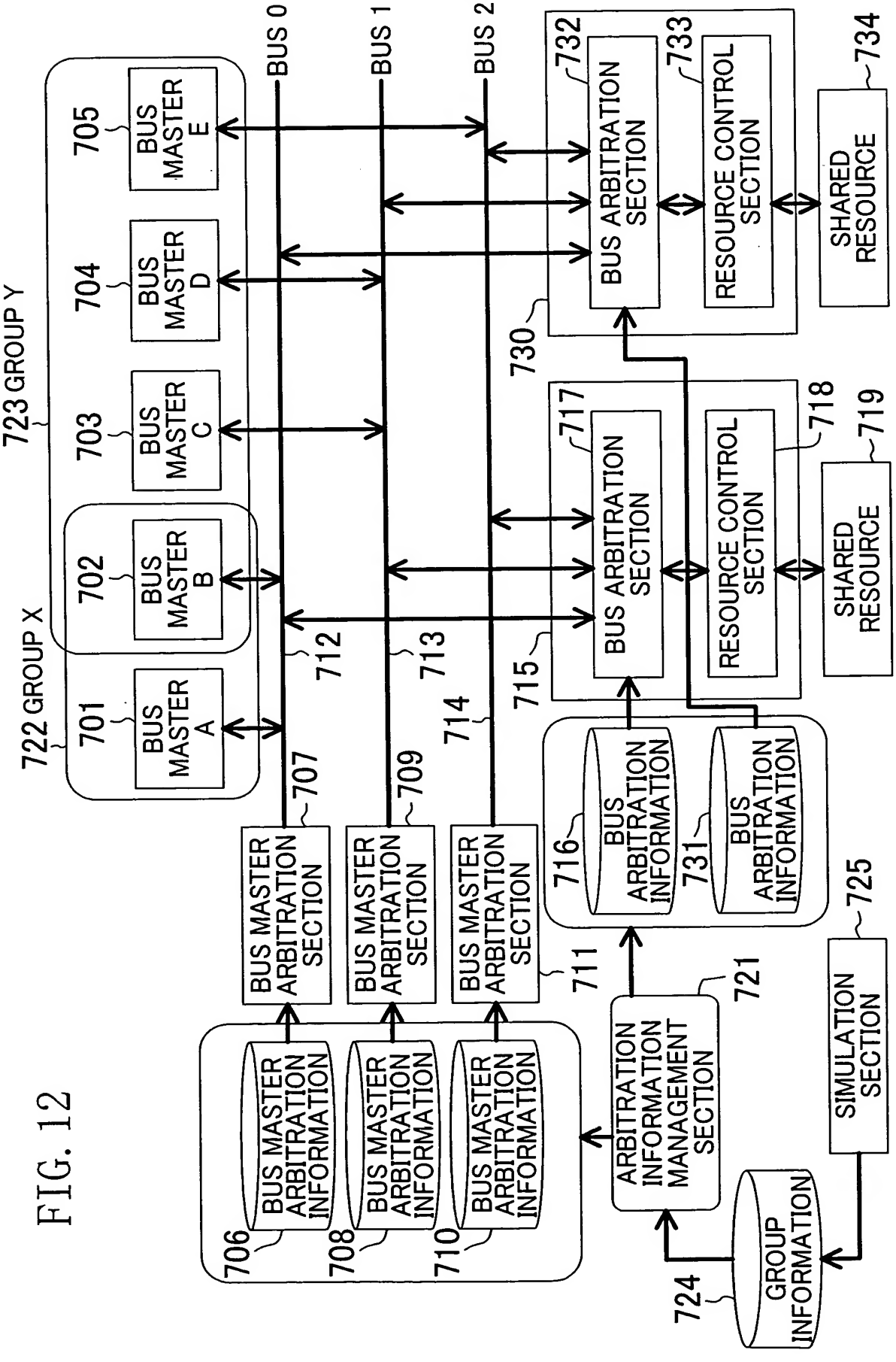

722 GROUP X
723 GROUP Y
701 BUS MASTER A
702 BUS MASTER B
703 BUS MASTER C
704 BUS MASTER D
705 BUS MASTER E
BUS 0
BUS 1
BUS 2
712
713
714
715
730
732 BUS ARBITRATION SECTION
733 RESOURCE CONTROL SECTION
734 SHARED RESOURCE
717 BUS ARBITRATION SECTION
718 RESOURCE CONTROL SECTION
719 SHARED RESOURCE
707 BUS MASTER ARBITRATION SECTION
709 BUS MASTER ARBITRATION SECTION
711 BUS MASTER ARBITRATION SECTION
716 BUS ARBITRATION INFORMATION
731 BUS ARBITRATION INFORMATION
725 SIMULATION SECTION
721 ARBITRATION INFORMATION MANAGEMENT SECTION
724 GROUP INFORMATION
706 BUS MASTER ARBITRATION INFORMATION
708 BUS MASTER ARBITRATION INFORMATION
710 BUS MASTER ARBITRATION INFORMATION

FIG. 13

1201

	BUS MASTER A	BUS MASTER B	BUS MASTER C	BUS MASTER D	BUS MASTER E
SHARED RESOURCE 719	9	12	6	9	20
SHARED RESOURCE 734	4	2	5	20	15

1202

BUS 0	BUS MASTER A-SHARED RESOURCE 719: 30%
	BUS MASTER B-SHARED RESOURCE 719: 40%
	BUS MASTER A-SHARED RESOURCE 734: 20%
	BUS MASTER B-SHARED RESOURCE 734: 10%

1203

BUS 1	BUS MASTER C-SHARED RESOURCE 719: 20%
	BUS MASTER D-SHARED RESOURCE 719: 30%
	BUS MASTER C-SHARED RESOURCE 734: 10%
	BUS MASTER D-SHARED RESOURCE 734: 40%

1204

BUS 2	BUS MASTER E-SHARED RESOURCE 719: 50%
	BUS MASTER E-SHARED RESOURCE 734: 50%

1205

	BUS 0	BUS 1	BUS 2
SHARED RESOURCE 719	30	30	40
SHARED RESOURCE 734	20	50	30

FIG. 14

1301

	0	1	2	3	4	5	6	7	8	9	ACCESS PERMISSION PERCENTAGE
BUS MASTER A-SHARED RESOURCE 719	1	0	0	1	0	0	1	0	0	0	30%
BUS MASTER B-SHARED RESOURCE 719	0	1	0	0	1	1	0	0	0	1	40%
BUS MASTER A-SHARED RESOURCE 734	0	0	1	0	0	0	0	0	1	0	20%
BUS MASTER B-SHARED RESOURCE 734	0	0	0	0	0	0	0	1	0	0	10%

1302

	0	1	2	3	4	5	6	7	8	9	ACCESS PERMISSION PERCENTAGE
BUS MASTER C-SHARED RESOURCE 719	0	0	0	1	0	0	1	0	0	0	20%
BUS MASTER D-SHARED RESOURCE 719	1	0	0	0	0	0	0	1	1	0	30%
BUS MASTER C-SHARED RESOURCE 734	0	0	1	0	0	0	0	0	0	0	10%
BUS MASTER D-SHARED RESOURCE 734	0	1	0	0	1	1	0	0	0	1	40%

1303

	0	1	2	3	4	5	6	7	8	9	ACCESS PERMISSION PERCENTAGE
BUS MASTER E-SHARED RESOURCE 719	0	1	0	1	0	1	1	0	0	1	50%
BUS MASTER E-SHARED RESOURCE 734	1	0	1	0	1	0	0	1	1	0	50%

FIG. 15

1401

SHARED RESOURCE 719	BUS MASTER A-PROCESS 1 : BUS MASTER A-PROCESS 2 :
	9 : 9 :
	BUS MASTER B : BUS MASTER C : BUS MASTER D : BUS MASTER E
	12 : 15 : 15 : 40

1402

BUS 0	(BUS MASTER A-PROCESS 1)-SHARED RESOURCE 719: 30%
	(BUS MASTER A-PROCESS 2)-SHARED RESOURCE 719: 30%
	BUS MASTER B-SHARED RESOURCE 719: 40%

1403

BUS 1	BUS MASTER C-SHARED RESOURCE 719: 50%
	BUS MASTER D-SHARED RESOURCE 719: 50%

1404

SHARED RESOURCE 719	BUS 0 : BUS 1 : BUS 2
	30 : 30 : 40

FIG. 16

1501

	0	1	2	3	4	5	6	7	8	9	ACCESS PERMISSION PERCENTAGE FOR EACH PROCESS
BUS MASTER A-PROCESS 1	1	0	0	1	0	0	1	0	0	0	30%
BUS MASTER A-PROCESS 2	0	1	0	0	1	0	0	0	0	1	30%
BUS MASTER B	0	0	1	0	0	1	0	1	1	0	40%

FIG. 17

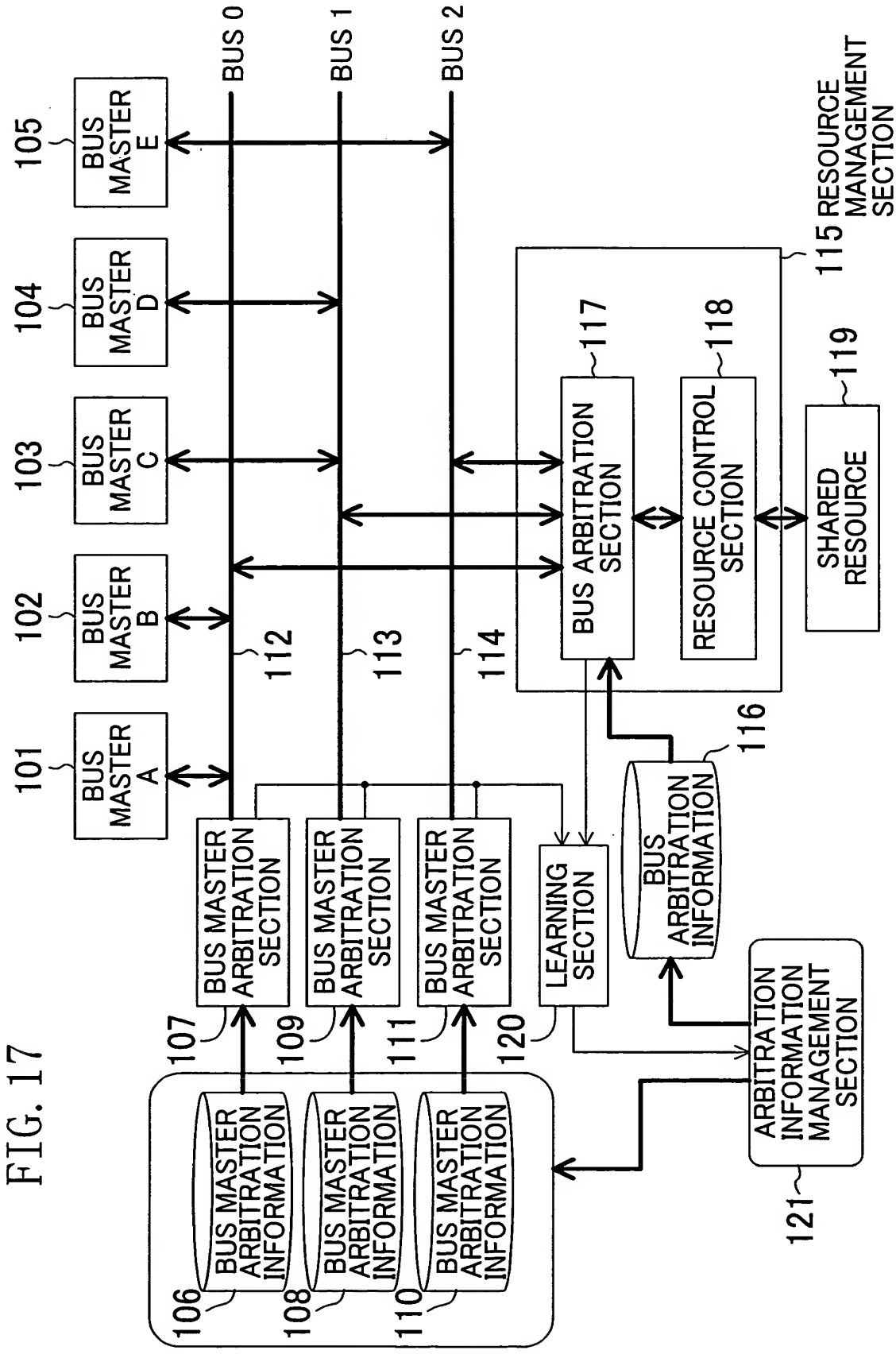

BUS MASTER A
BUS MASTER B
BUS MASTER C
BUS MASTER D
BUS MASTER E
101
102
103
104
105
BUS 0
BUS 1
BUS 2
112
113
114
115 RESOURCE MANAGEMENT SECTION
BUS ARBITRATION SECTION
RESOURCE CONTROL SECTION
SHARED RESOURCE
117
118
119
116
BUS ARBITRATION INFORMATION
LEARNING SECTION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
107
109
111
120
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
106
108
110
ARBITRATION INFORMATION MANAGEMENT SECTION
121

FIG. 18

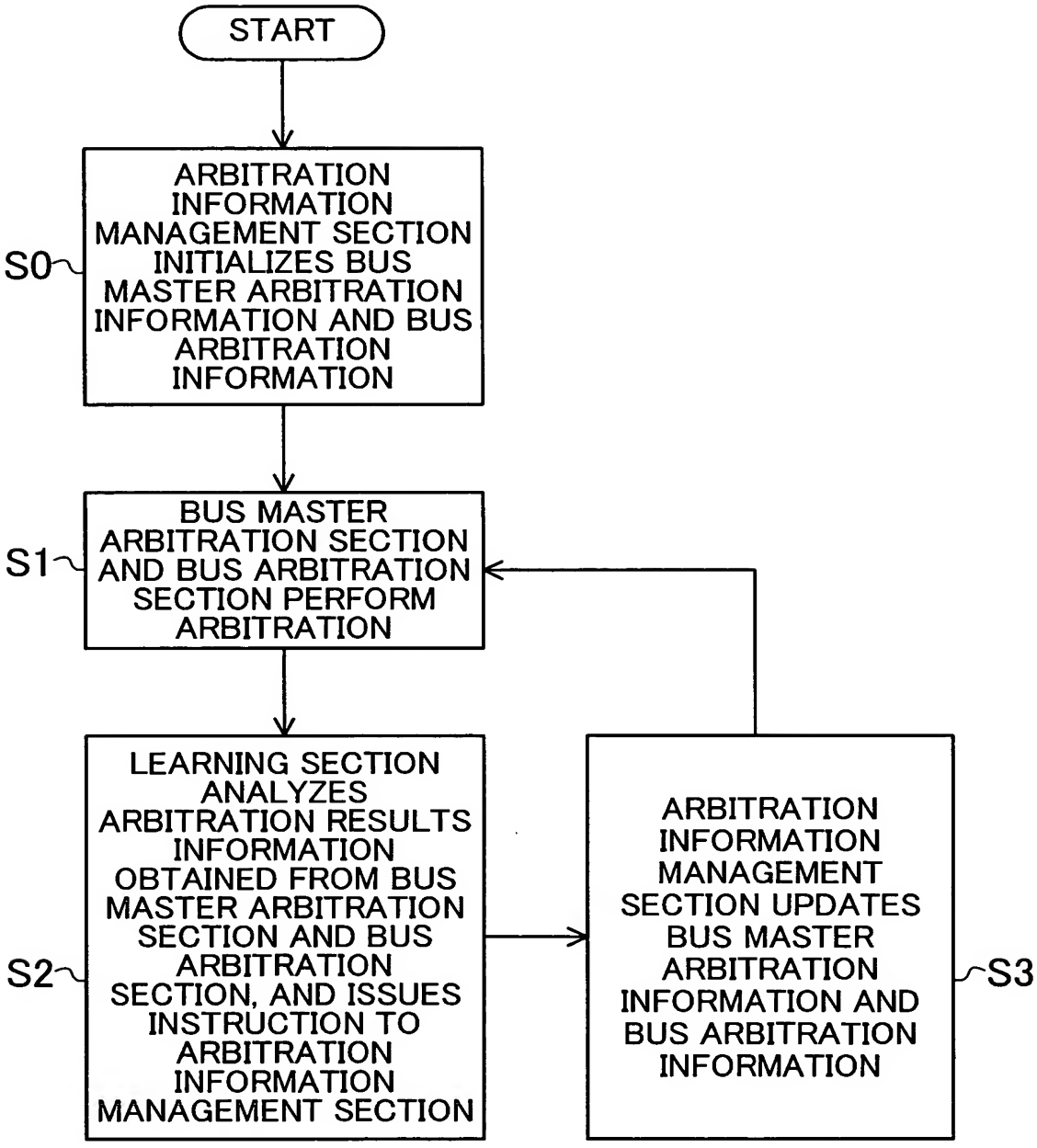

START
ARBITRATION INFORMATION MANAGEMENT SECTION INITIALIZES BUS MASTER ARBITRATION INFORMATION AND BUS ARBITRATION INFORMATION
S0
BUS MASTER ARBITRATION SECTION AND BUS ARBITRATION SECTION PERFORM ARBITRATION
S1
LEARNING SECTION ANALYZES ARBITRATION RESULTS INFORMATION OBTAINED FROM BUS MASTER ARBITRATION SECTION AND BUS ARBITRATION SECTION, AND ISSUES INSTRUCTION TO ARBITRATION INFORMATION MANAGEMENT SECTION
S2
ARBITRATION INFORMATION MANAGEMENT SECTION UPDATES BUS MASTER ARBITRATION INFORMATION AND BUS ARBITRATION INFORMATION
S3

FIG. 19

1601

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	0	0	1	0	0	1	0	0	1
BUS 1	0	1	0	0	1	0	0	1	0	0
BUS 2	0	0	1	0	0	1	0	0	1	0

HIGH

LOW

PRIORITY ORDER AMONG BUSES

1602

	0	1	2	3	4	5	6	7	8	9
BUS 0	①	1	1	①	0	0	0	①	①	0
BUS 1	1	①	0	0	①	0	①	0	0	0
BUS 2	1	1	①	1	1	①	0	0	0	①

1603

	0	1	2	3	4	5	6	7	8	9
BUS 0	0	0	0	0	0	0	1	1	1	1
BUS 1	0	0	0	1	1	1	0	0	0	0
BUS 2	1	1	1	0	0	0	0	0	0	0

1604

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	1	①	1	①	0	0	0	①	①
BUS 1	1	1	1	①	0	0	①	0	1	1
BUS 2	①	①	0	0	0	①	0	0	0	0

1605

	0	1	2	3	4	5	6	7	8	9
BUS 0	0	1	1	0	0	1	0	1	0	0
BUS 1	1	0	0	0	0	0	1	0	0	1
BUS 2	0	0	0	1	1	0	0	0	1	0

1606

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	①	①	0	0	0	①	①	0	0
BUS 1	①	0	0	1	1	①	0	1	1	①
BUS 2	1	1	1	①	①	0	0	0	①	0

FIG. 20

1701

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	0	0	1	0	0	0	1	0	0
BUS 1	0	1	0	0	0	1	1	0	1	1
BUS 2	0	0	1	0	1	0	0	0	0	0

HIGH

LOW

PRIORITY ORDER AMONG BUSES

1702

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BUS 0	①	0	0	①	1	1	1	①	0	0	①	0	0	①	1
BUS 1	1	①	1	1	1	①	①	1	①	0	1	①	1	1	1
BUS 2	1	1	①	1	①	0	0	0	1	①	1	1	①	1	①
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
BUS 0	1	1	①	0	0	①	0	0	①	1	1	1	①	0	0
BUS 1	①	①	1	①	0	1	①	1	1	1	①	①	1	①	0
BUS 2	0	0	0	1	①	1	1	①	1	①	0	0	0	1	①

1703

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	0	0	0	0	0	1	1	0	0
BUS 1	0	1	1	1	1	0	0	0	1	0
BUS 2	0	0	0	0	0	1	0	0	0	1

FIG. 21

1801

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	0	0	1	0	0	0	1	0	0
BUS 1	0	1	0	0	1	1	1	0	1	1
BUS 2	0	0	1	0	0	0	0	0	0	0

HIGH

LOW

PRIORITY ORDER AMONG BUSES

1802

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BUS 0	①	0	0	①	0	①	0	0	0	0	①	0	0	①	0
BUS 1	0	①	0	0	①	0	①	0	0	①	0	①	0	0	①
BUS 2	0	0	①	1	1	1	1	①	①	0	0	0	①	1	1
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
BUS 0	①	0	0	0	0	①	0	0	①	0	①	0	0	0	0
BUS 1	0	①	0	0	①	0	①	0	0	①	0	①	0	0	①
BUS 2	1	1	①	①	0	0	0	①	1	1	1	1	①	①	0

1803

	0	1	2	3	4	5	6	7	8	9
BUS 0	1	0	0	1	0	0	0	1	0	0
BUS 1	0	1	0	0	1	0	1	0	1	1
BUS 2	0	0	1	0	0	1	0	0	0	0

FIG. 22

1901

	0	1	2	3	4	5	6	7	8	9
BUS 0	0	0	0	0	0	0	0	1	0	1
BUS 1	0	0	0	0	0	0	1	0	1	0
BUS 2	1	1	1	1	1	1	0	0	0	0

HIGH

LOW

PRIORITY ORDER AMONG BUSES

1902

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BUS 0	①	①	0	0	①	0	1	①	0	0	①	①	0	0	①
BUS 1	1	1	1	1	1	1	①	1	①	0	1	1	1	1	1
BUS 2	0	0	①	①	0	①	1	1	1	①	0	0	①	①	0
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
BUS 0	0	1	①	0	0	①	①	0	0	①	0	1	①	0	0
BUS 1	1	①	1	①	0	1	1	1	1	1	1	①	1	①	0
BUS 2	①	1	1	1	①	0	0	①	①	0	①	1	1	1	①

1903

	0	1	2	3	4	5	6	7	8	9
BUS 1	0	0	0	0	0	0	1	0	1	0
BUS 2	1	1	1	1	1	1	0	0	0	0
BUS 0	0	0	0	0	0	0	0	1	0	1

FIG. 23

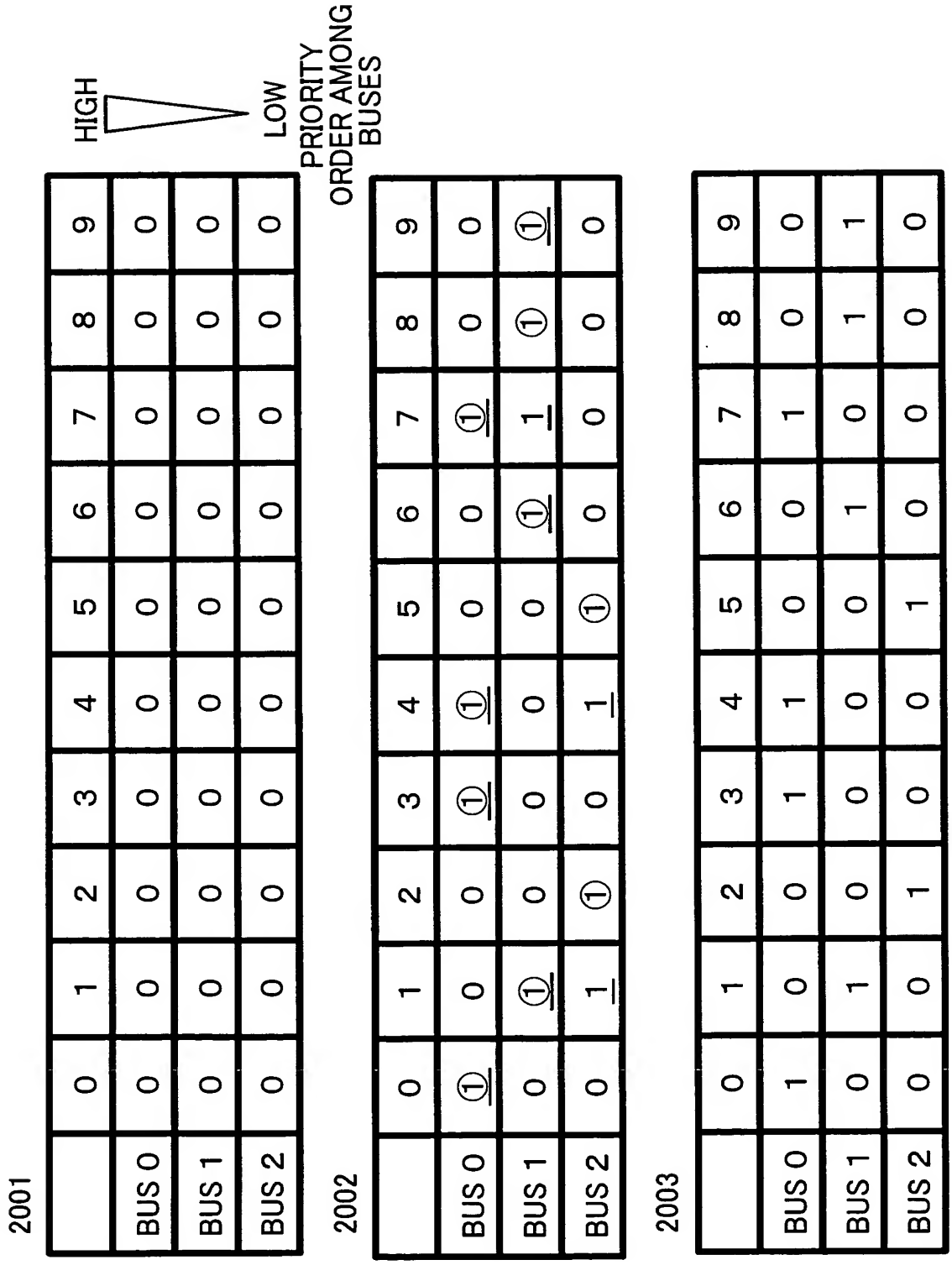

2001
2002
2003
HIGH
LOW
PRIORITY ORDER AMONG BUSES
0 1 2 3 4 5 6 7 8 9
BUS 0
BUS 1
BUS 2

FIG. 24

2101

	0	1	2	3	4	5	6	7	8	9
BUS MASTER A	1	0	0	1	0	1	0	1	0	0
BUS MASTER B	0	1	1	0	1	0	1	0	1	1

HIGH

LOW

PRIORITY ORDER AMONG BUS MASTERS

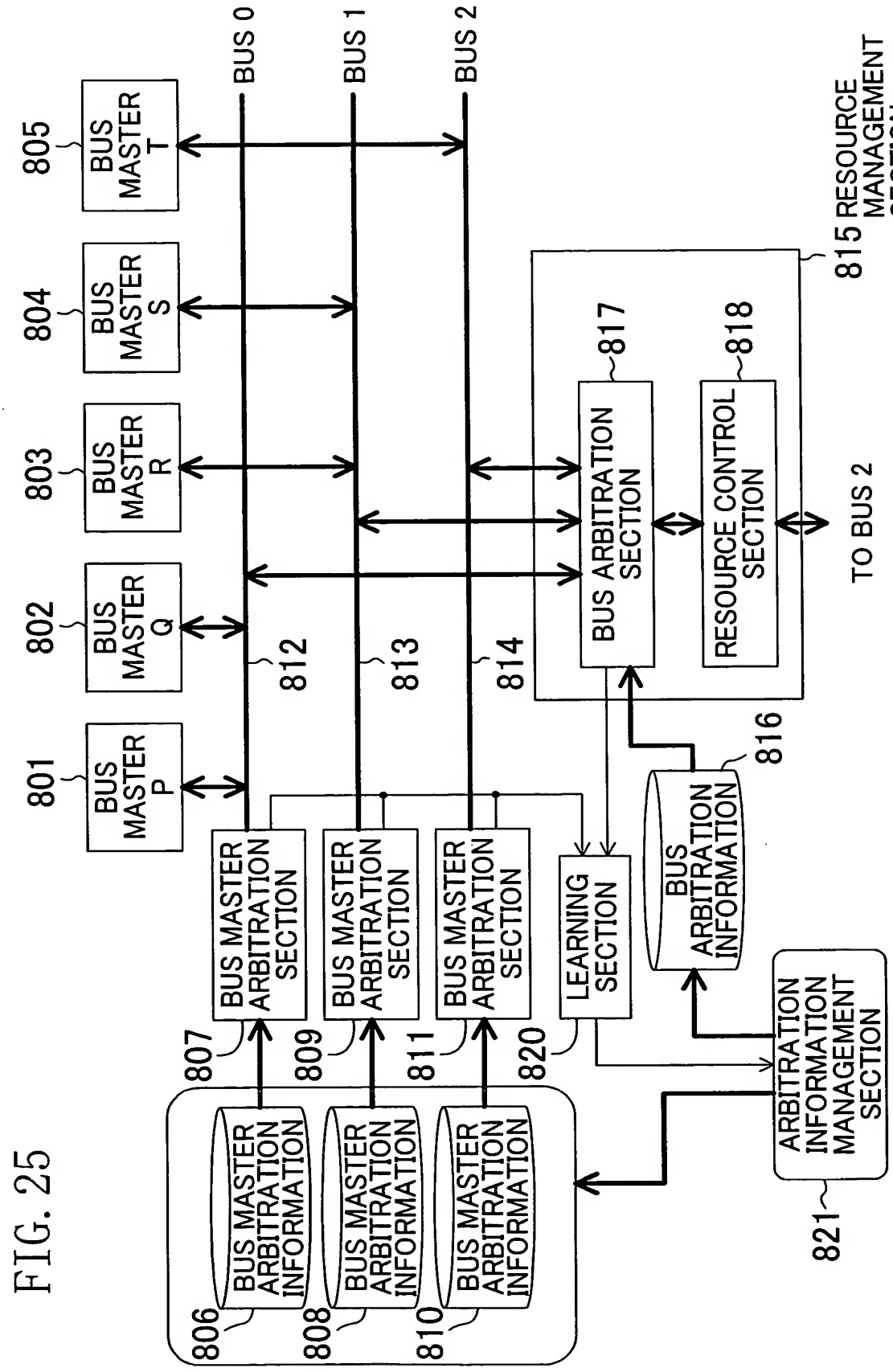
2102

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
BUS MASTER A	①	1	1	①	1	①	0	①	0	0	①	1	1	①	1
BUS MASTER B	1	①	①	0	①	0	①	1	①	0	1	①	①	0	①
	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
BUS MASTER A	①	0	①	0	0	①	1	1	①	1	①	0	①	0	0
BUS MASTER B	0	①	1	①	0	1	①	①	0	①	0	①	1	①	0

2103

	0	1	2	3	4	5	6	7	8	9
BUS MASTER A	1	1	1	0	0	0	0	1	0	0
BUS MASTER B	0	0	0	1	1	1	1	0	1	1

FIG. 25


BUS MASTER P
BUS MASTER Q
BUS MASTER R
BUS MASTER S
BUS MASTER T
801
802
803
804
805
BUS 0
BUS 1
BUS 2
812
813
814
815 RESOURCE MANAGEMENT SECTION
BUS ARBITRATION SECTION
817
RESOURCE CONTROL SECTION
818
TO BUS 2
816
BUS ARBITRATION INFORMATION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
BUS MASTER ARBITRATION SECTION
LEARNING SECTION
807
809
811
820
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
BUS MASTER ARBITRATION INFORMATION
806
808
810
ARBITRATION INFORMATION MANAGEMENT SECTION
821